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**Question Paper Code: 34014**

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2017

Fourth Semester

Civil Engineering

01UCE404 - MECHANICS OF SOLIDS II

(Regulation 2013)

Duration: Three hours

Maximum: 100 Marks

Answer ALL Questions.

PART A - (10 x 2 = 20 Marks)

1. Define Maxwell's reciprocal theorem.
2. State Castigliano's first theorem.
3. Define statically indeterminate beam.
4. What are the advantages of continuous beam over simply supported beam?
5. Write the formula for deflection of a fixed beam with eccentric point load and uniformly distributed load.
6. What is conjugate beam?
7. Write the assumptions made in Euler's theory of long column.
8. Define thick cylinders.
9. Define unsymmetrical bending.
10. Define compound cylinder.

PART - B (5 x 16 = 80 Marks)

11. (a) Derive the expression for strain energy in Linear Elastic Systems for the following cases. (i) Axial loading (ii) Flexural Loading [moment (or) couple]. (16)

Or

- (b) A beam simply supported over a span of 3m carries a uniformly distributed load of 20 kN/m over the entire span. Taking  $EI = 2.25 \text{ MNm}^2$  and using Castiglian's theorem determine the deflection at the center of the beam. (16)
12. (a) A simply supported beam of 16 m effective span carries the concentrated loads of 4 kN, 5 kN and 3 kN at distances 3, 7, and 11 m respectively from the left support. Calculate maximum shearing force and bending moment. Draw the S.F and B.M diagrams. (16)

Or

- (b) A fixed beam  $AB$  of length  $6m$  carries point load of  $160 \text{ kN}$  and  $120 \text{ kN}$  at a distance of  $2m$  and  $4m$  from the left end  $A$ . Find the fixed end moments and the reactions at the supports. (16)
13. (a) A cantilever  $15 \text{ cm}$  wide and  $20 \text{ cm}$  deep projects  $1.5 \text{ m}$  out of a wall, and is carrying a point load of  $20 \text{ kN}$  at the free end. Find the slope and deflection of the cantilever at the free end by using Moment Area Method. Take  $E = 200 \text{ GN / m}^2$ . (16)

Or

- (b) A simply supported beam is carrying a load  $W$  at the center. Calculate the slopes at its ends and the central deflection, using conjugate beam method. (16)
14. (a) A cylindrical air drum is  $2.25 \text{ m}$  in diameter with plates  $1.2 \text{ cm}$  thick. The efficiencies of the longitudinal and circumferential joints are respectively  $75\%$  and  $40\%$ . If the tensile stress in the plating is to be limited to  $120 \text{ MN / m}^2$  find the maximum safe air pressure. (16)

Or

- (b) Derive the expression for crippling load when both ends of the column are fixed. (16)
15. (a) Derive the formula for the deflection of beams due to unsymmetrical bending. (16)

Or

- (b) A thick steel cylinder having an internal diameter of  $100 \text{ mm}$  an external diameter of  $200 \text{ mm}$  is subjected to an internal pressure of  $55 \text{ MPa}$  and an external pressure of  $7 \text{ MPa}$ . Find the maximum hoop stress. (16)